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STATION'S QUARTERLY REPORT

1st Quarter
Calendar Year 1949



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Northeastern
Forest Experiment Station,
502 Upper Darby, Pa.
V.L. Harper, Director

1945



Not For Publication

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STATION'S QUARTERLY REPORT

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GENERAL

By V. L. Harper

Announcements

1. Charles R. Lockard, according to present plans, will join the Northeastern Station on June 1 by transfer from the Southern Station. He will be chief of our FUS unit, a position similar to that which he now holds in the South. This is definite.
2. Frank A. Ineson may be leaving soon for a short detail in Germany to assist Joe Kircher in winding up a survey of forest resources which has been under way by the Germans with only general control by Kircher's branch. Kircher is Chief of the Forestry and Timber Branch, Hipartite Control Office, Food, Agriculture and Forestry Group, Frankfurt, Germany (APO 757). A. A. Hasel of the California Station also may be assigned to the job along with Frank. These assignments are not yet definite.
3. And that is not all--Frank Ineson is also being considered for a job in Paris, France with E.C.A. following the completion of his assignment in Germany. This latter job also is not definite as yet.
4. James C. Rettie is considering a transfer to the Interior Department for assignment at Portland, Oregon. Jim has been offered a job of U.S.D.I. program planning for the Pacific Coast. The transfer is not yet definite.

Note: The above information may help each of you interpret the news from the grapevine.

QUARTERLY REPORT -- EDITOR

JANUARY-MARCH 1949

by E. vH. Larson

STATUS OF PUBLICATIONS

Publications During Quarter

Carter, R. M., and Rettie, J. C.

1949. Machining and preparation of the laminating stock.
Veneers and Plywood 43 (3): 34, 36-37.

Church, Thomas W., Jr.

1949. Effects of defoliation on growth of certain conifers.
Northeast. Forest Expt. Sta. Paper 22. 12 pp. (processed).
Upper Darby.

Forest Survey

1949. Forest statistics for Pendleton, Pocahontas, and Randolph
Counties, West Virginia. Northeast. Forest Expt. Sta. Forest
Survey Release 2. 34 pp. (processed). Upper Darby.

Gedney, Donald R.

1949. Land abuse, a flood, and then more floods.
Forest Leaves 34 (1): 17.

Harper, V. L.

1949. New horizons in forestry.
Forest Leaves 34 (1): 1-2, illus.

Hough, A. F.

1949. Deer and rabbit browsing and available winter forage in Allegheny
hardwood forests. Jour. Wildlife Mngt. 13 (1): 135-141, illus.

McIntock, Thomas F.

1949. Mapping vulnerability of spruce-fir stands in the Northeast to
spruce budworm attack. Northeast. Forest Expt. Sta. Paper 21.
20 pp., illus. (processed). Upper Darby.

McQuilkin, W. E.

1949. Forest research in the Anthracite Region.
Forest Leaves 34 (1) 18-19.

Northeastern Forest Experiment Station

1949. The annual report of the Northeastern Forest Experiment Station,
1948. Northeast. Forest Expt. Sta. 98 pp., illus. (processed).
Upper Darby. (Not yet available for public distribution.)

Nutting, A. D., Rettie, James C., and Banks, Wayne G.
1949. Rehabilitation of fire-damaged forest lands in southwestern Maine.
Northeast. Forest Expt. Sta. Paper 23. 22 pp. (processed).
Upper Darby.

Rettie, James C.
1949. Where is the bark?
Forest Leaves 34 (1): 5-6.

-----, and Simmons, Fred C.
1949. Estimates of bark supply in the Northeast.
Northeast. Wood Util. Council Bul. 25: 7-18, illus.

Rogers, Earl J.
1949. Estimating tree heights from shadows on vertical aerial photographs.
Jour. Forestry 47: 182-191, illus.

Schreiner, Ernst J.
1949. Creating better trees.
Forest Leaves 34 (1): 3-4, 14, illus.

1949. Why a Shade Tree Service.
Amer. Forests 55 (3): 26-27, 43-45, illus.

Simmons, Fred C.
1949. The Keystone Kiln Drying Association.
Forest Leaves 34 (1): 13-14.

1949. Loading. No. 14 in a series on good logging practice.
Timber of Canada 9 (5): 37-40, 74-77, illus.

Storey, Herbert C.
1949. Watershed research in the Delaware and Lehigh.
Forest Leaves 34 (1): 15-16.

Wright, Jonathan W.
1949. Producing elm seeds on cut branches.
Jour. Forestry 47: 210-214, illus.

Previously Submitted For Publication

Bratton, Allen W.
Cooperative farm woods management.
U. S. Dept. Agr. Yearbook, 1949.

Cook, David B., and Sims, Ivan H.
Beech utilization and management problems and possibilities.
Jour. Forestry.

Harper, V. L., Rettie, James C., and Davis, Kenneth P.
How well do we manage our forest lands?
U. S. Dept. Agr. Yearbook, 1949.

Jensen, Victor S., and MacAloney, Harvey J.
Recovery of birch fifteen years after partial cutting.
Jour. Forestry

Larrimer, W. H., and Schreiner, E. J.
Arboretums.
U. S. Dept. Agr. Yearbook, 1949.

Little, S., and Moore E. B.
The ecological role of prescribed burns in the pine-oak forests
of southern New Jersey. Ecology.

McQuilkin, W. E.
Direct seeding of trees.
U. S. Dept. Agr. Yearbook, 1949.

Schreiner, Ernst J.
Poplars can be bred to order.
U. S. Dept. Agr. Yearbook, 1949.

Amateur tree breeders? Why not!
U. S. Dept. Agr. Yearbook, 1949.

Genetics in relation to forestry.
Sci. Monthly

Simmons, Fred C.
Harvesting the timber crop.
U. S. Dept. Agr. Yearbook, 1949.

Northeastern loggers' handbook.
U. S. Dept. Agr. Misc. Pub.

Northeastern logging practices.
Chapter for textbook on logging, to be published by Mc-Graw-Hill
Co., New York.

Pulpwood procurement in the United States.
Chapter for textbook on manufacture of pulp and paper, to be
published by MacMillan Publishing Co., New York.

Harvesting woodlot crops.
U. S. Dept. Agr. Farmers Bul.

Westveld, Marinus

Airplane seeding: A new venture in reforestation.
Unasylva

Wright, Jonathan W.

Local genetic variation in silver maple.
Jour. Forestry

Some anomalous fir flowers.
Univ. Pa. Morris Arboretum Bul.

Submitted For Publication During Quarter

Carter, Roy M.

Wood byproducts from mill waste.
Vt. Bur. Indus. Res.

Doverspike, George E.

The problem of marketing timber.

Filip, S. H.

Thinning young oak stands for small mine timber—at a profit.
Forest Leaves.

Husch, Bertram

Modern techniques in forest surveys.
Forest Leaves

McQuilkin, W. E.

Preparing planting sites with silvicides.
Forest Leaves

Simmons, Fred C.

Helping the logger.
Forest Leaves

Sawmill techniques.
United Nations Conference on Conservation.

New developments in sawlog procurement.
Forest Products Research Society.

Mechanized logging.
Vt. Bur. Indus. Res.

New developments in harvesting sawlogs.
Wood

Trimble, G. R., Jr., and Tripp, Norman R.
Observations on the soils of the lodgepole pine forests.
Jour. Forestry

Wright, Jonathan W.
Tree breeding at the Morris Arboretum,
Forest Leaves

Ready For Processing By Station

Forest Survey
Forest statistics for Hancock County, Maine.
Forest Survey Release

Forest statistics for northern New Hampshire.
Forest Survey Release

Flood Control Survey
Tentative report on flood control survey of the Connecticut River
watershed. (For review purposes only.)

Simmons, Fred C.
Recruiting and training labor for woods work.
Station Paper.

In Process Of Or Awaiting Editing

Carter, Roy M.
The costs of poor kiln drying.
Station Paper.

Rettie, James C.
Estimates of bark supply in the Northeast.
Station Paper

-----, and Ineson, Frank A.
The Otsego Forest Products Cooperative Association of Cooperstown,
N. Y.: an evaluation. U. S. Dept. Agr. Misc. Pub.

Williams, Ellis T.
Forest insurance.
Station Paper

Being Reviewed

Bethlahmy, Nedavia, and Reigner, Irvin C.
Factors affecting the formation of concrete frost.
Trans. Amer. Geophys. Union.

Camp, H. W., and Bickford, C. A.

Use of binoculars with mil scale as a training aid for estimating form class. Station Paper.

Doverspike, George E.

Preliminary survey of markets and prices of forest products in the Del-Mar-Va Peninsula of Delaware and Maryland.

Station Paper

Filip, S. M.

Thinning young oak stands for small mine timbers--at a profit.

Station Paper.

Forest Survey

Forest statistics for southern New Hampshire.

Forest Survey Release.

Hough, A. F.

Reforestation of old burns may be aided by chemical control of herbaceous and shrubby growth.

Husch, Bertram

Fuelwood consumption in New Hampshire.

Jour. Forestry or Station Paper.

Little, S.

Ecology and silviculture of whitecedar and associated hardwoods in southern New Jersey. Ph. D. thesis, for publication by Yale Univ. probably.

Stoeckeler, J. H., and McQuilkin, W. E.

Tree planting in the Northeastern States and Lake States Region.

U. S. Dept. Agr. Farmers' Bul.

Whelan, Donald E.

A method for evaluating the hydrologic effects of land use on large watersheds. Trans. Amer. Geophys. Union.

Wright, Jonathan W.

Pollen dispersion of some forest trees.

Returned To Author For Revision

Somes, H. A., and Moorhead, G. R.

Damage by prescribed burns to existing oak-pine stands of southern New Jersey.

Little, S., and Moore, E. B.

Mechanical preparation of seedbeds in converting oak-pine stands to pine.

A BUSY PLACE

One of the busiest places in the Upper Darby headquarters during the last few months has been the processing room. Here Harold Muldoon has kept the multilith machine going almost steadily, turning hundreds of reams of paper into finished products such as the annual report, Forest Survey releases, Station papers, and a variety of forms and other duplicated material. The pressure has become so great that it was necessary for the Director to establish priorities for the various jobs.

Some of the burden has been borne by the mimeograph machine, and some by the second multilith machine--until it broke down beyond use. It is awaiting repair.

One of the time-consuming jobs is collating--putting pages together and stapling them. In working away at this job, James Harris is confronted by great piles of material awaiting collation. Meanwhile, growing piles of finished material await distribution until the Director, his secretary, and the editor finish building a new mailing list and a streamlined way of distributing publications.

QUICKER DISTRIBUTION

Several Station papers and Forest Survey releases now await distribution. Distribution of the Station papers has been delayed because the mailing lists have been undergoing a complete reformation. The work of bringing the mailing lists up to date, carried on by Marian Thomas, is now virtually completed. New addressograph plates have been obtained, card files have been set up, and the mailing lists have been reclassified. On the basis of this reclassification, a check list has been prepared, which will enable the Director to indicate quickly the exact distribution desired for any Station publication.

The new method of distribution is expected to enable us to distribute publications much more quickly and efficiently than in the past. Moreover, it will provide a quick check on what distribution has been made.

Meanwhile, the Station's mailing list has increased greatly--and without any effort to build up a mailing list. Two years ago our mailing lists contained the names of 305 persons who had requested copies of all our publications. Today this same list contains 738 names. Of course there are additional lists of persons who have requested publications of certain subjects, and these lists have also increased in size. On the average, about 1,600 copies of each publication are needed to satisfy requests. Requests for some papers greatly exceed this number.

THAT vs WHICH

Probably every author who submits material to the Station for publication scratches his head occasionally and wonders, "Why did the editor change this which to a that?" The author probably assumes that changing which to that and that to which is some little game that editors play when they don't have enough work to keep them busy and are tired of swapping commas for semicolons.

On the other hand, editors feel that an overabundance of which's is an occupational ailment that generally afflicts writers. Editors tend to believe that a fellow who uses that's quite properly when he is talking is apt to shift gears suddenly when he starts to immortalize his thoughts by committing them to paper, and substitute which's. There is a mistaken idea that there is little difference between the two relative pronouns except that one is informal and the other is formal.

There is a distinction. It depends on whether the clause introduced by the relative pronoun is nonrestrictive (merely adding some little descriptive matter that could be left out without damage) or restrictive (adding some descriptive matter that is essential to the meaning of the sentence). For example, it is correct to say

"The Delaware River, which flows through Philadelphia, is polluted."

or

"The rivers that flow through Philadelphia are polluted."

but if you say

"The Delaware River that flows through Philadelphia is polluted."

or

"The Delaware River which flows through Philadelphia is polluted."

you imply that there are several Delaware Rivers, but the one that flows through Philadelphia is polluted. This is nonsense, of course. In such sentences it is often hard to figure out what the writer does mean.

The commas in such a sentence are important. The same rules apply to "who", and here the importance of the comma is even more marked. For example,

"He made a study of the natives who have cannibalistic tastes."

does not mean the same thing as

"He made a study of the natives, who have cannibalistic tastes."

QUARTERLY REPORT -- ADMINISTRATIVE SERVICES
JANUARY-MARCH 1949

by G. A. Cashion and R. M. Kendall

Property Inventory

For the first time in several years the Station furnished accountable field officers with an itemized list of the property charged to them according to the Station property records. The advantages of this innovation was to enable the Station Headquarters to correct the nomenclature under which property items should be classified and reduce the time required in making the physical inventory in the field. The disadvantage was that for this first year under the system it was necessary in many instances to make many changes in nomenclature which henceforth will be unnecessary.

For the most part field inventories have been submitted promptly and action is under way to adjust and reconcile the records accordingly.

Inspections

Fiscal and safety inspections completed during this Quarter have been as follows:

1/12/49	-	Cashion	-	Delaware Basin
2/28/49	-	Kendall	-	Winnipiesaukee
3/1/49	-	Kendall	-	Bartlett (Property Inventory)
3/2/49	-	Kendall	-	Gale River (Property Inventory)
3/14-15/49	-	Cashion	-	Mountain State

Our inspection schedule includes a planned fiscal and safety inspection of the remaining branches before the end of the calendar year.

Inspection of motor vehicles at Station Headquarters was completed by Mr. Strickenburg on February 16, 1949.

QUARTERLY REPORT — MENSURATION AND BIOMETRY

JANUARY-MARCH 1949

by C. A. Bickford

Unusually interesting problems were presented to statistical service in the past quarter: uniform compartment records for managed experimental forests; estimation of errors of drain for forest survey; analysis of data on soil moisture in relation to use and vegetative cover; design of a study of growth of cove hardwoods in West Virginia. The increased volume and quality of these problems present a stimulating challenge.

In designing experiments in forestry we frequently find individuals with attributes that cannot be measured by an ordinary rule or tape but must be sorted into classes. Mathematically, such a function is called discrete (in contrast with ordinary continuous functions). For example: measurements of diameter are continuous while species provides a basis for discrete classes. With the feeling that there is some confusion in the use of such classes, the following has been written in the hope that it may result in more efficient use of discrete classes in forest research.

In the simplest case, each of a number of individuals falls into one of two classes: heads or tails; black or white; etc.; the concept is readily extended to more classes--as the six sides of a cube. In forest research, individual trees may be classified by species and groups of trees by forest type; the concept has also been extended to include treatments in a controlled experiment.

Difficulties are encountered whenever class limits are so vague that an individual may be put in either of two classes. In forest survey, for example, different men might put the same plot in different classes of volume, age, type, etc. To the extent that these differences are compensating, or average out, they are unimportant. When there is a real difference, however, corrective action is needed: the definition may need rewording, the men may be insufficiently trained, etc.

A more serious error results from ambiguity of treatment definitions in experiments that run for several years and that may be administered by several different men. The designer of such a study needs to think out the experiment in sufficient detail to be assured that the proposed treatment can be executed (heavy thinnings, for example, cannot be repeated many times and have a stand left to thin or harvest). Furthermore, proposed treatments should be so clearly defined that his successors have no cause to wonder what further treatment is scheduled or when this experiment is finished.

Discrete classes must be used when the attribute cannot be measured as a continuous function. The method of discrete classes is often applied

to data that can be so measured (for example, volume per acre is the basis of forest survey stand size class). It is also useful in more complex situations, as for example, experimental treatments. In this last use, care is especially necessary to obtain consistent results that may be logically interpreted.

QUARTERLY REPORT --FOREST MANAGEMENT

JANUARY-MARCH 1949

by I. H. Sims

Nothing spectacular came of the Division's activities during the quarter; comments, suggestions or approvals were given the Branches on six working plans, two fire plans, and two problem analyses. Some progress was made on reviewing publication manuscripts but, since they were given second priority to plans, a considerable backlog of manuscripts was carried over. The annual report took quite a bit of Sims' time early in the quarter.

Clark devoted considerable time to the knotty job of devising a tentative system of records for compartment studies on the experimental forests and a memorandum for the field explaining them. Late in the quarter a long memorandum on the same subject was received from the Washington office, necessitating some revision in what had been prepared.

Hough spent several weeks at the Beltsville Experimental Forest assisting Rushmore on the analysis and interpretations of data from a ten-year old set of thinning plots in Maryland. Plans for further silvicultural and management studies on the experimental forest were also discussed.

Sims spent two days in New Haven with McGuire and the staff of the Bureau of Entomology and Plant Quarantine considering insect problems of plantations, particularly the white pine weevil. This insect has been a pest for many years yet a very considerable program of research seems needed to develop practical methods for avoiding or controlling the damage it causes.

Late in the quarter Westveld attended the Service-wide conference on Timber Management Plans at Hot Springs, Arkansas. He was commentator on several subjects and presented papers on them.

Sims spent four days at the Anthracite Branch, two each on scrub-oak conversion problems and plans, and on the allocation of portions of the Pocono Experimental Forest to research uses in the immediate future.

QUARTERLY REPORT--FOREST ECONOMICS

JANUARY-MARCH 1949

By J. C. Rettie

Rehabilitation Of Fire-Damaged Lands in Southwestern Maine

This quarter saw the study of the Maine fire-damaged land problem advance toward completion. A progress report prepared by Rettie and Banks in collaboration with Forest Commissioner A. D. Nutting was finished and issued in a multilith edition of 2,000 copies. A meeting of town officials and other interested persons was held at the York County Court House on February 25 to discuss the findings of the progress report. It was there decided that a copy of this report should be made available through the Forest Commissioner's office to all the owners of burned land and to various other interested groups. The report received considerable notice and comment in several Maine newspapers.

Plans have been made to conduct a further sampling survey of the burned area as soon as back-country roads become passable. The object will be to determine more accurately what area of the burn has adequate seed trees to provide natural restocking, and also what area is now restocking adequately with merchantable species. This survey has been designed to give acreage estimates with an accuracy of a plus or minus 5 percent. The field work will require about 3 man-weeks. This will probably complete the Station's work on this particular study.

Appraisal Of Experience Of Otsego Forest Products Cooperative Association

Work on this project advanced rapidly during the quarter. The first draft of the report was completed and submitted for informal review to several of the persons most closely associated with the Association's affairs during the period of the Station's responsibility as loan administrator. Many helpful comments and suggestions were received. A second draft of the report is now in preparation looking toward publication as a Department of Agriculture bulletin.

Marketing And Prices Of Farm Woodland Products

A proposed project for a survey of markets and prices that would have initiated a state price and market news service in West Virginia had to be postponed pending a clarification of the respective responsibilities of the several interested state agencies. It is expected that these problems can be cleared up and that the survey will be undertaken in the forthcoming quarter.

Considerable time was devoted to the development of working plans for future studies. These now include a survey of the Christmas tree marketing situation in Pennsylvania and New York, an appraisal and report on the various timber sale contracts now in use for the sale of farm woodland products with special reference to the possibilities for maintenance of more adequate control of cutting practices by the woodland owner, a study of the experience of those processing plants that have employed a system of log grading in the purchase of raw materials, and a study of the possibilities for the development of local markets for charcoal produced in small cinder-block kilns with special reference to disposal of small woodland cleanings and thinnings. Some attention has also been given to the problem of marketing maple syrup.

Ownership Of Small Woodlands In New England

This project, carried on in cooperation with Harvard University and the Federal Reserve Bank of Boston, also moved rapidly toward completion. Machine tabulation of the field data was completed. Work on the drafting of the report is now under way.

QUARTERLY REPORT -- FOREST SURVEY

JANUARY-MARCH 1949

by F. A. Ineson

During this quarter significant progress was made in several lines. Inventory field plot work was completed in Vermont. Estimates of commodity drain, including logging waste, were compiled for New Hampshire. The first statistical release on forest areas and timber volumes for West Virginia was issued. And, the State of Pennsylvania, in cooperation with Production and Marketing Administration of the Department of Agriculture, made arrangements for new photography for 57 counties.

Inventory

Favorable winter weather permitted a greater amount of field plot examination than was anticipated. The final field plot sheets for Vermont were received in Upper Darby on March 30. Inventory work was also continued in West Virginia and New York. The forest area represented by field plots examined during this quarter amounted to approximately 1,458,000 acres for West Virginia, 567,000 acres for New York, and 989,100 acres for Vermont. The forest type mapping in the field is progressing according to schedule.

New aerial photography for Garrett, Allegany, and Washington counties was received from the Maryland State Forest Service. This photography covers about 602,000 acres of forest land. Additional photography soon may be available for other sections of the State.

Following a meeting at which Harper and Ineson conferred with several officials in Harrisburg a conference was called by the Pennsylvania State Planning Board. The conference was held on March 22 and resulted in the pledging of sufficient funds to provide new aerial photography within the next two or three years for all except 10 counties of Pennsylvania that have been recently covered. All of this photography will be at a scale of 1:20,000 and taken with an 8 1/4-inch lens. We have recommended that several heavily forested counties in the central portion be photographed with infra-red film and minus-blue filter. White pine and hemlock are mixed with hardwoods in this section.

Compilations

Forest area and timber volume tabulations were completed for the statistical release on the State of New Hampshire. Similar tabulations are nearly finished for the Monongahela section of West Virginia. Punched cards are being prepared for the Southern West Virginia Coal Fields and for Vermont.

Plans were developed during the quarter for the compilation of

West Virginia game habitat survey data. Lee Wilson prepared the preliminary plans and spent two days in Upper Darby discussing details with Roland Ferguson. The card-punching job for this survey is now about two-thirds complete. Tabulations have been furnished for the first unit of area.

Growth And Drain

Progress was made by Bickford in estimating growth for New Hampshire. Husch completed preliminary estimates of commodity drain for New Hampshire. The drain against sawlog material in 1946 was about 410 million board feet; the drain against all material amounted to nearly 130 million cubic feet. Lumber accounted for more than 90 percent of the sawlog drain and 75 percent of the drain on all material. Pulpwood use was responsible for 21 percent of the drain on all material; fuelwood for 5 percent.

Although the total drain on the forests of New Hampshire in 1946 differed little from that estimated for 1944 during the Forest Service Reappraisal, the distribution of the drain by commodities is strikingly different. It is quite probable that some of these differences are more apparent than real. The 1946 estimates were based on a canvass of all industries and a study of logging waste. The earlier estimates were rough ones based on meagre information.

The indications are that much less pulpwood is cut from saw-timber trees in New Hampshire than earlier estimated. A smaller proportion is obtained from hardwoods. Most pulpwood is today cut from softwoods less than 9 inches in diameter.

The drain against live timber for fuelwood in 1946 was less than one quarter that roughly estimated for 1944. A survey of fuelwood consumption for 1946 reveals that nearly 10 percent of farm homes and 40 percent of rural nonfarm homes use no wood for fuel. In 1946 farm dwellings used an average of 9 cords of wood; rural nonfarm dwellings, less than 2 cords.

Reports

Forest Survey Release No. 2, "Forest Statistics for Pendelton, Pocahontas, and Randolph Counties, West Virginia" has been released. Advance copies of a similar release for Northern New Hampshire are ready for distribution. The Hancock County and Southern New Hampshire releases are ready for processing.

Personnel Changes

Suzanne Seginak and Marie Jackson were welcome additions to the Division. The former is assigned to the Compilation Section as a statistical clerk, and the latter is replacing Edith Jasper who is leaving us shortly to be married.

Fay Gershuni resigned on March 5 because of poor health. Her successor has been selected but has not yet arrived on the job.

Plans For The Next Quarter

1. All field work in Vermont and West Virginia should be completed.
2. Steps are being taken to employ 6 student assistants for summer field work.
3. Additional data will be tabulated for West Virginia Conservation Commission.
4. Statistical reports to be issued:
 - Hancock County
 - Northern New Hampshire
 - Southern New Hampshire
5. Statistical reports to be prepared:
 - Monongahela Section, West Virginia
 - Southern West Virginia Coal Fields
 - New Hampshire State
 - Southern Vermont

QUARTERLY REPORT -- FLOOD CONTROL SURVEYS
JANUARY-MARCH 1949

by Arthur Bevan

Personnel

Don Gedney was detailed January 21 to the Central States Station at Columbus, Ohio, to assist the S.C.S. in the survey of the Upper Mississippi River watershed.

Surveys and Preliminary Examination Reports

The preliminary report on the Chowan River watershed in Virginia and North Carolina has been completed by S.C.S. and been submitted to Washington. The report was reviewed by us and has our concurrence.

The Connecticut River Survey Report has been sent back to us after preliminary review by our Washington office and is being processed at the Station as a tentative report for submission to the States and other interested agencies.

The Merrimack River Survey Report (New Hampshire and Massachusetts) is nearing completion and a tentative draft will be submitted to Washington shortly.

With the completion of the inventory stages of the report, work on the flood control program for the Allegheny watershed (Pennsylvania, New York) is proceeding. There is still a lot of work to be done on the evaluation of the program and the determination of costs and benefits.

A good start has been made on the analysis and compilation of land-use inventory, cover, and soils in the Monongahela watershed (West Virginia, Pennsylvania.)

Several meetings have been held with S.C.S. on the Roanoke River Survey Report (Virginia, North Carolina.) This report being prepared by S.C.S., Spartanburg, is nearing completion.

The Station has concurred in the Youghiogheny River Survey Report (Pennsylvania, Maryland, West Virginia) prepared by S.C.S., Upper Darby, and the report has been sent to Washington.

Forest Service participation in the Lehigh River Survey, an S.C.S., Upper Darby, report, has reached the analysis and report-writing stage.

Work has been started on an advance study and preparation of a work outline on the Upper Susquehanna River watershed (New York, Pennsylvania) tentatively scheduled for field work this summer.

Studies

Frost Study.--Analysis of the data collected during the winter of 1947-48 is complete except for some special studies to correlate frost data with runoff on small watersheds. Methods are being developed in cooperation with the Delaware Basin Branch to permit prediction of the areal extent of concrete frost by land-use classes that existed at the start of each winter flood being studied on our surveys. Frost observations made by the Delaware Basin Branch during the past winter have proved of little value because of the mild weather.

Soil Moisture Relations.--Analysis of data collected last field season is nearing completion. There are indications that some interesting results have been obtained. Percolation rates through unconsolidated parent material (C horizon) beyond a depth of from 18 to 22 inches from the surface do not seem to be affected by differences in land use and cover. It would seem, therefore, that we should be primarily concerned with the upper portions of the soil profile in any evaluation of a land-use and management program.

QUARTERLY REPORT

FOREST UTILIZATION SERVICE

January 1 - March 31, 1949

TIMBER HARVESTING

Swiss Cableways

According to present indications both the Wyssen and the Lasso cableway systems from Switzerland will be installed in the Northeast during the coming summer. These cableways were described and illustrated in Forest Products Laboratory mimeographs 1637-27 and 1637-29 respectively.

The Wyssen cableway is to be installed on a pulp company's operations in the central Adirondacks in New York State. The complete equipment, including sled-mounted winch and motor, blocks and fittings for the skyline, intermediate supports etc., but minus the cable, will cost about \$14,000 by the time it is delivered. Another similar installation is also being made on an eastern Canada pulpwood operation. The two companies are bringing over a crew of three Swiss workmen to help with the installation, and in training native crews in its operation. This Station has been attempting to help the U. S. company arrange for the entry of this Swiss crew into the country. Studies of the cableway in operation, and further exploration of the possibility of American manufacture of this system, are planned at the time the installation is made.

A New York City concern is importing a Lasso cableway from Switzerland. They have asked us to help them arrange for trials and demonstrations when it arrives. Due to import difficulties it is not yet certain when this outfit will be available. Meanwhile several possible sites for early installation are being investigated.

Bow Saw Blades

The presharpened and fitted bow saw blades of Norwegian manufacture, designed to be used until they get dull, and then thrown away like a used razor blade, are being tried in a number of locations in this Station territory. Reports to date have been quite favorable. They seem to be more accurately fitted and sharpened than blades that have been available on the market heretofore. Their hardness, however, is somewhat disappointing. They prove to be only about 2 points Brinnel harder than blades of Swedish manufacture that have been commonly available. They can be cut readily with an ordinary file. How much longer they will retain their sharpness in comparison to blades of Swedish and American manufacture has not yet been determined. The price of the Norwegian blades remains attractive. One large U. S. mail order house is selling single 30 inch Norwegian blades at 69¢ each, as compared with \$1.09 charged for domestic blades last Fall.

Router Type Chainsaw Chain

The trials of the new router-type chainsaw chain, manufactured for almost all existing types of saw, have also been very promising. Several trials of this chain, against the conventional type of chain, on standard makes of saws, indicate that it cuts almost twice as fast in frozen hardwood. It also seems to require much less frequent sharpening, and sharpening is easier and quicker when it does become necessary. The Homelite Corporation, which has previously supplied only 14 and 20 inch bars with their light $2\frac{1}{2}$ horsepower electric saw motor has found it possible to cut efficiently with a 30 inch bar fitted with this chain, with the same motor.

TIMBER CONVERSION

Beech Utilization Series

Plans for the proposed series of Station Papers on beech utilization are moving forward. A preliminary prospectus for this series was compiled and sent to about 15 possible cooperating agencies during February. This prospectus suggested that an overall Northeastern Technical Committee on Beech Utilization, comprised of representatives of the various agencies, be formed to plan the series of papers, and decide who would be best qualified to write each paper, and to review and comment on it. Responses to the letter accompanying this prospectus have been unanimously favorable, so an organization meeting of this proposed committee will be held at the New York State College of Forestry at Syracuse, N. Y. April 19. At this time it is hoped that the scope of this proposed series, both territorial and textual, can be decided upon, and that at least tentative assignments for their preparation, review and publication can be made. Minutes of this meeting will be distributed to cooperating agencies and all eastern Forest Experiment Stations.

All that is planned at present is a compilation of existing information on the utilization of beech, with little or no additional research. It is expected that many unsolved problems in regard to the utilization of beech will be pointed out; and that perhaps a concerted attack on the solution of some of these problems can be made.

United Nations Conference

The United Nations Conference on Conservation and Utilization of Natural Resources is now apparently pretty definitely scheduled to be held at Lake Success, N. Y. in August or September of this year. Fred Simmons' introductory paper on "Sawmill Techniques" has been completed and submitted to the Secretariat and is now in process of translation into the several official languages of the Conference. Preprints should be available in the near future. Simmons also contributed a section on the Lake States and Northeast to George Drake's paper on "Timber Harvesting Practices" which is also being translated and published at Lake Success.

It is probable that the Northeastern FUS unit will be called upon to arrange for exhibit material and field trips on wood utilization in connection with this conference.

Wood Burning Furnace

Preliminary reports on the tests of the new magazine-type wood burning furnace, operating on the distillation principle, arranged in cooperation with the Rhode Island manufacturer, are very encouraging. Two of these units have been installed as space heaters above the floor, one in a Connecticut garage and the other in a New Hampshire logging camp. Several others have been installed as central heating plants in typical rambling New England farm homes. The mild weather experienced so far this winter has not given them a very severe test, and they have been in operation only a short time, but so far they are all functioning very satisfactorily.

Sawdust Utilization

Help has been given one of the larger steel companies, operating Adirondack ore, in locating sources of softwood sawdust for smelting. This company has perfected a process for smelting magnetite ore with anthracite culm, which they can get delivered for \$7 a ton. Two to three percent sawdust is mixed with it to lighten up the mass and allow gases to escape. This 2 to 3 percent, at the present rate of production, calls for 70 to 80 tons a day of sawdust. They hope to get it at a comparable price to that they are paying for coal. Unfortunately there are very few softwood sawmills on the western side of the Adirondacks where their operations are located, so their most logical source of supply seems to be the white pine sawmills around Lake Champlain. They were given a list of about 40 such sawmills, and are now attempting to arrange for purchase and transportation of the needed supply. The possibility of hogged or chipped slabs and edgings, and woods waste, is also being investigated.

Bark Utilization

A Pennsylvania pulpmill is actively investigating the possibilities of markets for their hardwood bark, removed dry in a newly installed 50 foot barking drum at the mill. They have engaged a consulting engineer who has been a frequent visitor at this office. The bark, which is 70 percent oak, is quite fibrous in nature. This engineer claims that the dust fraction can be marketed quite readily to linoleum manufacturers in this territory. So far the most promising uses for the fiber fractions seem to be as insulating material, perhaps with treatment with some asphaltic or bituminous material; or as a constituent of a wet process insulating board.

Much interest in bark utilization has been stimulated by the conference on this subject held by the Northeastern Wood Utilization Council at the Massachusetts Institute of Technology last Fall, and an article by J. C. Rettie of the Station in the January issue of the Pennsylvania Forestry Association publication, "Forest Leaves." Numerous inquiries in various phases of the subject have been answered by the FUS unit.

WOOD CHEMISTRY

Molasses

Feeding tests with wood molasses are now going forward at the University of New Hampshire. That institution is making complete nitrogen and energy balances with four heifers. Each heifer will have one experiment with field cured mixed hay, both with and without a supplemental mixture of blackstrap or wood molasses. The data are being assembled in a form that should be easy to analyze statistically.

The experiment should be completed in May. According to preliminary reports the wood molasses are well accepted by the heifers when mixed with the hay, but are not well cleaned up when they are not well mixed and settle to the bottom of the feed box.

Charcoal

With the largest wood distillation firm in the hands of the receivers, and several of the retort plants in Pennsylvania closing down, there is a revival of interest in smaller plants for making charcoal. The Connecticut Agricultural Experiment Station has published a revision of Hicock and Olsen's bulletin, "The Connecticut Charcoal Kiln" with a supplemental chapter by R. H. Fenton of this Station, "The Manufacture and Utilization of Charcoal". One of these kilns is now in operation in Tioga County, New York State. Inquiries on manufacturing processes of charcoal on a small scale have recently been received from points as far separated as New Hampshire and West Virginia.

PRESERVATION

"Stepping" Process

Experiments are continuing on our Norris Doxey Project in Connecticut with the "stepping" process of wood preservation. This involves intentionally lodging a tree in felling, and then sliding the butt into a drum of preservative solution. Coniferous plantations furnish an excellent site for such a process. Experiments last fall indicated that as much preservative would be taken up in 7 days in the butt 12 foot (tobacco post) length, as would be distributed in 70 days using the Clemson College method. Chromated zinc chloride is the preservative used. Experiments are now being resumed to obtain better data on costs, and to test the applicability of the process to fence post lengths.

Trials will probably also be conducted of a colloidal suspension of copper naphthamate in water being developed by a Simsbury, Connecticut firm. The theory is that such a suspension would make possible the penetration of green wood by a sap stream system; and then, when the wood is seasoned, a non-reversible chemical reaction would occur depositing metallic copper in the wood structure. Results so far have been variable. Good penetration has been secured with green southern pine by a pressure process, but steeping has not been so successful. Experiments are continuing.

SEASONING

Kiln Drying

A meeting of the Northeast Kiln Drying Association was held at Farmington, Maine on March 11. Prof. Gregory Baker of the University of Maine discussed his current experiments in the drying of northern hardwoods in the Forest Products Laboratory experimental kiln, with particular emphasis on stress schedules. Ray McGlaufflin discussed problems in building small kilns and revamping old ones. A joint meeting with the New England Kiln Drying Association is being planned for June, to be held probably in the vicinity of Conway, N. H.

A Philadelphia concern brought in some samples of mahogany which had acquired a black stain in drying in their forced circulation kilns. This stain in some instances was concentrated along stickers, and in others was in small flecks scattered over the surface of the boards. It was found scattered throughout the piles sometimes on the tops and sometimes on the under surfaces of the boards. A sample was sent to the Laboratory, where our preliminary diagnosis that it was ink stain, caused by a combination of iron and tannic acid, was confirmed. How the iron laden water was scattered so widely throughout the piles has not yet been determined, but the kilns and the piling processes are being closely checked to minimize possibility of a recurrence. Stickers of hardwood other than oak are being tried.

GENERAL

A 13½ minute silent, color, 16 mm. motion picture of the logging equipment demonstration held at Cooperstown, N. Y. last Fall taken by Bill Harlow of the New York State College of Forestry, is now available. The Station is securing a print, which will be shown at the National Meeting of the Forest Products Research Society in Grand Rapids, Mich. May 3 in connection with Fred Simmons' paper on "New Developments in Harvesting Sawlogs". It will also be available for loan to interested cooperators. A recorded commentary on the devices shown in this picture was made by Simmons during a recent visit to Syracuse, and a sound track may be added to the picture.

One-hundred and sixty-two written requests for information have been answered by the Northeastern FUS during the quarter; excluding requests for publications, which have been answered by form letter. The majority, as usual, have been on logging methods and equipment, many of them from students engaged in writing theses or term papers. Next most frequent were requests for information on utilization possibilities for bark, sawdust and other wood waste. Increasing interest was shown in possible markets for low grade lumber, which is accumulating unsold in considerable quantities at most Northeastern sawmills. Hardwood dimension, pallets, and flooring were the subjects of some of these inquiries. Wood burning stoves constituted another popular subject. Interest in kiln drying seems to be definitely decreasing with the accumulating stocks of air dried stock at the sawmills and concentration yards. An increasing interest in means of improving the quality of sawing at small sawmills seems to be building up.

QUARTERLY REPORT -- HOPKINS EXPERIMENTAL FOREST

JANUARY-MARCH 1949

by Frank E. Cunningham

This first quarter of the new year was marked by quite favorable weather. An exceptionally mild winter was experienced and good progress has been made on the three major projects now underway on the forest.

Hardhack Conversion Study (H-1)

This study is designed to test the effectiveness of three major methods of site preparation prior to planting in fields overgrown with hardhack and a scattered overstory of inferior species.

A bulldozer has been employed to mechanically clear part of the site of the hardhack and scattered overstory of red maple. In addition, it was also used to clear fire lines around each of three plots scheduled for burning. In all, 3 areas were cleared by this method in a total of 40 hours. The chief drawback to this method, outside of the cost, is the fact that considerable amounts of the top soil are lost in the process.

The burning on two of the three of the areas scheduled for this treatment has been completed. In this type of cover, burning does not seem to be too successful. Even on days with a high burning index, the fuels on the surface, scant at best, burn fairly readily but the hardhack stems failed to ignite. To burn them it is necessary to break them down so that they are in contact with the ground surface. So far we have been unable to effectively break them down so they would stay there even when running over them with the bulldozer.

Work is now in progress on the scheduled secondary site preparation treatments. A bog harrow, well weighted down with stones, is being used to break up the root masses left after the major treatments were completed. This device does a fairly satisfactory job, even on the check plots where no major treatment was employed. A more detailed report on this treatment will appear in the next quarterly report.

Small Woodland Ownership Management Study (H-2)

This study is directed towards the problems associated with the management of small woodland holdings. Essentially, it is a pilot-plant test of the application of the two higher levels of cutting practice, geared to the capacity of a farmer who may have a couple of hired hands available for the work. The objectives are to build up the stands while cutting merchantable products each year.

The study embraces two woodlots, one 25 acres in area and the other approximately 50 acres. To date, the boundaries of the two wood lots have been surveyed and marked in the field. Maps of their location and outlines have been prepared.

The trees on the 25-acre woodlot have been selected and marked for cutting and the inventory of the stand has been completed. This stand averages 2400 cubic feet per acre or approximately 30 cords. Approximately 4 cords per acre have been marked for removal in the initial cut. Annually thereafter, a very light cutting will be made until the optimum growing stock both in volume and in quality have been attained. Thereafter, only the annual growth will be removed annually.

The marking and inventory of one-fifth of the 50 acre stand have been completed to date. Summary of the data will await completion of this work.

Cutting-Practice-Level Plots (H-3)

The work of laying out and establishing on the ground 4 cutting practice level plots has been completed. Each plot approximates 6.5 acres in size and represents a different level of cutting practice as follows:

1. High Order: This implies frequent improvement cuttings, without consideration of economic returns during initial cuts so as to build up as quickly as possible the optimum growing stock, both in quantity and quality. Cultural work such as the selection and release of desirable reproduction, the selection and release of potential crop trees in advanced reproduction, thinning pole size crop trees, and the elimination of wolf trees by means of girdling or poisoning, and planting where necessary is contemplated.

2. Good Practice: This level implies frequent improvement cuts. However, each cut should have sufficient volume to make it financially possible. Cuts will perforce be at somewhat longer intervals than under the High Order level. Optimum stocking will be achieved after a longer interval than under the High Order level. This level also requires some cultural work such as the removal of wolf trees and the selection and thinning of pole sized crop trees.

3. Under this level, heavy cuts at intervals exceeding fifteen years will be made. The only effort to control composition and stocking will be made at the time of these periodic cuts. A sufficient number of trees per acre will be left to provide an adequate stocking of the better species. Under this level, no trees under 6" d.b.h. will be cut and a minimum of 60 pole sized trees and 15 sawtimber trees over 12" d.b.h. will be left per acre. Where necessary 4 pole sized trees may be substituted for 1 sawtimber tree.

Poor Cutting: This method implies a clear cutting which will remove all merchantable trees from the stand. In this territory it means that we may reasonably expect that all trees over 8" d.b.h. will be removed except for culls.

The selection and marking of the trees for removal has been completed. No effort was made to mark the trees on the Poor Plot, for this will be essentially an operator's choice. It is expected that under prevailing commercial standards, all merchantable trees down to 8" d.b.h. will be removed from the stand. The following table summarizes the volumes marked for removal on each of the four plots.

<u>Cutting Level</u>	<u>Area</u> (Acres)	<u>Marked For Removal</u>	
		<u>Cu. Ft.</u> per acre	<u>Percentage</u> removed
High Order	6.17	546.4	35.6
Good	6.63	620.9	33.9
Fair	6.00	1008.1	51.3
Poor*	6.18	1740.6	79.2

Note: Because of the high volume of defective material in the stands, the initial cut in both the High Order and the Good Plots are essentially equal. Later operations will show the differences under these two levels.

*The volume shown under Poor is composed of the volumes in trees 9" d.b.h. and over.

Genetics - - During this quarter, plans were made and areas selected on which to make crop tree clonal tests on 25 hybrid poplar clones and sapling clonal tests on 50 hybrid poplar clones for the genetics project. Cuttings have been received and stored in preparation for planting. Arrangements have been made for the necessary plowing and harrowing prior to planting. The selected areas have been marked off in the field. As soon as the plowing has been completed, the plots will be established on the ground and planting started.

Maintenance and Improvements:--The foundation walls under the office have been repaired. Defective bathroom fixtures in the bathroom have been replaced and work is now under way of replacing the floor and parts of the wall which had to be removed for the plumbing installations.

Miscellaneous:-- A recent check on prices for wood products in this area indicates that this market is in a state of flux. The demand for low grade products has dropped off considerably. Hardwood pulp wood market is practically non-existent at present. This may have some bearing on our ability to locate outlets for the products from our contemplated cutting operations.

On March 5, a new Oliver-Cletrac crawler tractor, Model HG-42 equipped with a rear mounted winch and a hydraulic angle dozer blade was received. We are now familiarizing ourselves with its operation. To date it has proved extremely useful in some of the site preparation work on the hardhack plots.

Fire weather observations were resumed on the first of the month. Judging from our difficulties in burning over our hardhack plots, even with the aid of kerosene and old crank case oil, we have little to fear from fire on the Hopkins.

QUARTERLY REPORT -- LEBANON EXPERIMENTAL FOREST

JANUARY-MARCH 1949

by S. Little

Much of the effort during the past quarter was spent on the preparation of manuscripts. Two papers were completed and sent out for review, and two others were revised. At the present time there are four being reviewed in the Upper Darby office.

Cutting of all oaks on about 5 more acres was completed during the quarter, and the slash was piled and burned on 7 acres of experimental plots where cutting had been completed.

About 1,500 acres of the Lebanon State Forest were prescribed-burned during the past winter, as were portions of the Bass River State Forest and some tracts of private land. At the present time the total amount treated is not known. However, plans had previously been prepared for burning an appreciable acreage. Besides the 1,500 acres that had been scheduled in the Lebanon State Forest, as much as 1,750 acres had been recommended for treatment in a single private holding.

The acreage burned in the Lebanon State Forest included about 100 acres of the Experimental Forest plus 20 acres of experimental plots.

QUARTERLY REPORT -- FARM FORESTRY RESEARCH
(Cooperative Project in Connecticut)
JANUARY-MARCH 1949

by R. H. Fenton

PRESERVATIVE TREATMENT

Preservation with Water-Soluble Preservatives

In late March, the preservative treatment of red pine by stepping, in cooperation with the State Park and Forest Commission, was renewed, the work having been suspended during the winter. This experiment was started last fall in an attempt to secure fully treated 12-foot tobacco poles in the relatively short time of one week, using a minimum of equipment. Chromated zinc chloride was used for most of the first treating. For the remainder of the work, straight zinc chloride only will be used as solutions of this chemical appear to move considerably faster in green wood than do the chromated zinc chloride solutions. In addition, 7-foot material--farm fence posts and town highway posts--is now being treated by the same principle. Present indications are that these shorter posts become treated full length in about 3 days.

In a corollary experiment, some 7-foot posts are being treated by the barrel method, with variations. This treatment consists merely of standing fresh-cut posts, already cut to length, in a barrel containing a measured volume of zinc chloride solution. Previous experimenters with this simple method have advocated solution strengths of 33% to 50% strength; the present work is being carried on with 10% solutions as it is believed full-length treatment will be secured sooner.

Further experimental treating methods with this chemical have been started in which fresh-cut fence posts are placed directly in service, then given treatment by placing about one pound of dry salt in a cap affixed to the top of the post, actually a modification of the tire-tube method; in a short period the salt goes into solution from atmospheric moisture and then into the sapstream of the post. Earlier experiments indicated full-length treatment of red pine in 270 days by this method. Other species as well are now being utilized in this experiment.

A new market for red pine of sapling size has developed and the required product is being secured from the tops of trees being treated for posts and poles, also from small suppressed trees in the plantations. These are tree stakes, required by the State Highway Department as temporary support for roadside planting along the new parkways. They are 7 feet long with a maximum diameter of 4 inches at the large end and a minimum of 2 inches at the small end. Treatment is not required since

their useful life need not be over 2 years. Present delivered price will be about 30 cents each.

Preservation with Oil-Soluble Preservatives

Following the initial treatment of seasoned red pine highway posts last December, it was decided to await the arrival of warm weather before continuing the treating. It was possible to secure the recommended absorption of pentachlorophenol fuel oil solutions in cold weather, but a comparatively long soak of up to 96 hours in the cold solution was required.

Although penta is highly recommended by several authorities as a wood preservative, one difficulty not mentioned in its use is the general nonavailability in this region of concentrated solutions from local sources. The dry chemical, however, is available locally and cheaply from a large chemical company. Therefore, in cooperation with the Connecticut Agricultural Experiment Station, a laboratory experiment is being conducted to determine the feasibility of making up concentrated solutions with various solvents--largely alcohols--without elaborate equipment.

Another oil-soluble preservative of high toxicity is copper naphthenate. A fairly large-scale treating program, in which this office is cooperating has been started in producing red pine highway posts, using this preservative supplied by a local manufacturer. Since the material required peeling and seasoning before treatment, a small secondary experiment is being tried to attempt expediting both processes. Briefly, some red pine were felled last fall and winter and left on the ground with the tops intact. It is expected the boles of these trees will season out rather rapidly and that early beetle activity will loosen the bark allowing for its easy removal. In theory, the posts then cut from these trees would be ready for treatment, probably about June.

HARVESTING STUDIES

Two small pieces of woods equipment were tested during the quarter. They were a power saw chain with a router type tooth, and a Norwegian bow saw importation, both items being forwarded by FUS. To date, the router chain has been tried by four different individuals owning the requisite make of saw, as much on a demonstration basis as purely a test. A local chain saw distributor ran the chain at two different chain-sawing and woodlot management demonstrations before some 200 loggers, farmers, and woodlot owners. It was also given a one-day trial on a logging operation. Some times on cutting speed were secured, also on rate of cutting of a conventional chain. The router chain was clearly the faster in hardwoods but not softwoods, as follows:

Type of saw	Species	Time per sq. ft. (seconds)
4 h.p. router chain	Hemlock	20.3
4 h.p. conventional chain	"	18.0
4 h.p. router chain	W. Oak	28.2
4 h.p. conventional chain	"	41.5

On this test, the router chain would not make a straight cut in hardwoods, invariably leading left or right. Inspection of the laminated bar on this make of saw showed it had opened up slightly allowing the chain to rock excessively in the groove. This probably accounts for the trouble, bearing out the chain manufacturer's recommendation for a solid bar for this make of saw.

The bow saw was given a trial on a hardwood operation, cutting fuel wood. The hardwood blade, as received, would not run straight in the cut and required fitting after which it sawed perfectly about 6 cords of 4-foot wood with no apparent loss of keenness. The softwood blade is being used exclusively on all red pine being felled and bucked in the preservation experiments described above.

A new piece of harvesting equipment made its bow in Connecticut woodlands this quarter. It is a chain saw, to be called the "Wasp", manufactured by a Connecticut concern but is not yet on the market. It is strictly a 1-man saw, weighs 37 pounds ready for use, and has a 5-hp. motor with an 18-inch chain running over a bearing-mounted wheel at the end of the rather narrow bar. The proposed price will be in the range of competitive makes of saws.

PRIMARY PROCESSING

During the quarter, this project cooperated with a Rhode Island manufacturer in securing three trial installations of their new wood-burning hot air furnace in Connecticut. Another installation was made in Vermont and one in New Hampshire.

Observations made of the three local installations indicate the furnace is a very satisfactory piece of equipment, under proper conditions. Such conditions, however, may be rather exacting, particularly with respect to a good, uninterrupted draft. Roughly, this furnace should consume about 1 cord of seasoned wood in 10 days to provide enough heat for about 8 rooms under average winter conditions. One of the trial users, apparently experiencing a faulty draft, was unable to burn a cord of well-seasoned hickory in less than 15 days with insufficient heat output during that time. One drawback to the furnace appears to be the tendency to smoke from the loading door at the time of firing. Another is the fact that loading is not feasible before

the previous charge of fuel has nearly been exhausted. This may occur at an inconvenient time of the day or night. It would appear not too difficult to eliminate both these shortcomings with a single change. Such a recommendation has been made to company representatives.

When this furnace is properly installed, it appears to burn seasoned or green material equally well. The latter should be mixed with a few sticks of seasoned wood for best results, however. One user reported some difficulty in burning seasoned hemlock which, however, had become somewhat dozy.

Miscellaneous Notes

Sawmill activity in the State received a boost from the mild winter, but in February a sharp drop in the demand for ties affected many of the smaller mills dependent on this market. Fuelwood cutting appeared to have increased this winter but the demand remained low, partly due to the mild weather. Indications are that next winter the fuelwood supply will be relatively large but at lower roadside prices.

The writer participated in two meetings during the quarter. One was the annual marketing and utilization meeting at which factors and new developments affecting the local forest industries were discussed. The other was as a member of a panel on profitable woodlot management at the Farm and Home Congress in March at Providence, R. I.

George Doverspike from the Station spent a day in the area with the writer to investigate the local charcoal manufacturing and marketing situation.

PUBLICATIONS

A preliminary report on the production of red pine tobacco poles by the stepping method, by R. H. Fenton and H. C. McKusick, has been sent to Upper Darby.

QUARTERLY REPORT - ADIRONDACK BRANCH

JANUARY-MARCH 1949

by John R. Curry

Hardwood Methods of Cutting

In 1938 Westveld, Recknagel, and Plusnin established 3 hardwood methods-of-cutting plots on the Finch Pruyn Experimental Forest. Data obtained 9 growing seasons later, in May, 1948, were recently analyzed by Rutherford. Two methods of cutting (clear and selection) were compared to a third (check) treatment in this experiment.

The clear-cut plot has failed to reproduce during this interval. A dense blanket of Rubus which apparently came in soon after the opening was made still covers this plot. Red spruce is prominent among the few scattered seedlings present. This species apparently is better able to stand the heavy brush competition than the hardwoods.

The selectively cut plot was reduced 30% in basal area in 1938 by removal of poor and defective trees, principally beech. Under this type of cutting there was no response by reproduction. Basal area growth was good; the plot now has very nearly as much as before cutting. The stand consists primarily of an overstory of hard maple and birch, with an understory of beech most of which is poor and defective. This understory responds first to any cutting in the upper crown. At least one-half of the growth in basal area must be discounted as worthless. It occurred on beech stems which are too defective or of such poor form that they are without value as growing stock.

The check plot also showed an appreciable increase in basal area --about 8%. Almost all of this growth is accounted for by beech. Beech is definitely on the increase on this plot and on the 30-acre check plot at Lot 7 Hudson River.

Study of the structure of these stands has led us to be quite pessimistic over the application of selection cutting to this type. Any gradual removal from above is sure to favor the more tolerant and defective beech which here seldom attains merchantable size in sound condition. Very few maple or birch are found in the understory. A heavy removal of the tolerant beech understory would appear to offer the best chance for a good crop of thrifty trees on such stands. Such a cut would give the prolific small maple seedlings a chance to come up under a light (40%) overstory. This type of shelterwood cutting at least invites exploration and it will be tried in an extension of this valuable study to be undertaken next summer.

Killing Cull Trees

A working plan organizing on a formal basis the tree killing experiment which Fenchak conducted on an exploratory basis has been prepared. This year he will make 9 seasonal treatments each with 45 trees of 10" d.b.h. and over. Poisons tested will be Ammate and sodium arsenite. Species to be tested will be beech, hard maple, and yellow birch. Treatments will be applied in holes bored by the King Power Tapper at distances of 4, 8, and 12 inches around the circumference.

Exploratory work will be continued, with tests of 2, 4-D and 2,4,5-T and other silvicides in oil and other penetrating substances, utilizing additional techniques and methods of application. Our work on the experimental forest and elsewhere, has impressed us with the large amount of cull trees we are carrying in our forest stands. We are determined to find the cheapest method of disposing of this material.

Growing Stock Classification

In our recent cruise at Paul Smiths we classified trees into 2 classes; "good" (Class I) and "poor" (Class II) growing stock. For merchantable size trees of no value we had a third class -- "cull". This simple classification of growing stock has proved of great value to us in evaluating forest conditions by the various types. We intend to continue to use this method on practically all future remeasurement work.

In our line-plot survey we located plots at intervals of 5 x 5 chains by compass and tape. We decided to cut a 5 foot stake to locate each plot center for possible future reference. For various reasons we have found it desirable to revisit several plots during the winter. One time we checked the damage being done by our salvage cutting through plot remeasurement. Again, we visited some plots to find out why beech is so poor and reclassified our trees by classes of defect. It is easy to pick up a line of stakes and to locate yourself accurately on any part of the forest. In this cruise we scratched a mark on the bark of each measured tree with a Syracuse bark scratcher. This provides a fairly accurate method of reconstructing plots in case of loss of stakes.

Meetings

Curry visited the New York State College of Forestry in February with Kramer of Region 7 to interview prospective employees. He also addressed the Tupper Lake Rotary and the Tupper Lake High School on the work of the branch. Rutherford talked to the Paul Smith's forestry students on fire control.

Visitors

Visitors during the quarter included Dr. Hardy L. Shirley of the New York State College, Joshua A. Cope, Extension Forester, and

Professors Stone and Dawson of Agronomy, Cornell; R. E. Wilson, George Trafton, and Messrs. Dewan and Dowling, all technical foresters of the Adirondacks also called.

QUARTERLY REPORT -- ANTHRACITE BRANCH

JANUARY-MARCH 1949

by C. F. Burnham

The Pocono Experimental Forest

Cutting-practice-level plots.--The unusually warm winter slowed progress considerably in the removal of products from these plots. Shortly after mid-January most anthracite mines started to curtail production and by the first of March were working only 2 or 3 days each week. Consequently the need for mine props gradually dropped until the last 2 weeks in March when it ceased completely because of the miner's 2 week memorial holiday. Although faced with this reduced demand our cutting contractor has been able to dispose of more than 600 tons of material, which is about one-half the total amount. We still are hoping to complete the cutting on schedule--by June 30.

Other plans.--Further progress was made during the quarter in preparing plans for the utilization of the entire forest. Approval was granted by the Director and the Monroe Water Supply Company to construct a stream-gaging station as the first step in setting up a combined forest management-water influence study. Most of the materials have been moved to the site preparatory to starting construction early in May, weather permitting.

Sims spent several days here early in March reviewing our plans for other studies on the forest. As a result of his visit our proposals have been put into final form for the Director's review and approval.

Scrub Oak Conversion Study

As previously reported this study involves planting experiments on three different areas. One, on the Delaware-Lehigh Experimental Forest, was planted in the spring of 1948. The second, known as the Bear Creek Area, was prepared for planting last fall using our BDH Cletrac tractor equipped with an angle-dozer to do the furrowing. While a passable job was obtained, this piece of equipment definitely was not powerful enough. A contract has now been let to have the third area, on State Game Land, furrowed with a Caterpillar D-7, which is approximately twice as heavy as the Cletrac. This is one more attempt to find a machine that will open satisfactory furrows economically.

Both the Bear Creek and State Game land areas will be planted this spring.

Manuscripts Prepared for Publication

During the past quarter McQuilkin has devoted considerable time to

completion of two projects carried over from Beltsville. One was a series of tests of treatments to prolong the life of burlap nursery seed-bed covers. Four of the treatments tested, costing from $\frac{1}{2}$ to 2 cents per yard for materials, proved sufficiently promising to be recommended for further trial by operating nurseries. A paper summarizing the results of this study is ready for submission of the Journal of Forestry.

The second was a series of studies on treatments to promote healing of tree wounds, started in 1942 as part of the camouflage program requested by the Army Engineer Board. The earlier phases of the work dealt primarily with the use of growth-regulator chemicals, a field in which those charged with developing camouflage techniques were especially interested. Results with these substances as stimulants to wound healing were entirely negative. In later phases of the work, emphasis was shifted more to wound dressings where lanolin and several mixtures having lanolin as a base were found to be excellent for this purpose. A final phase extended the experiments to the treatment of increment borer wounds to prevent subsequent stain and decay. A paper summarizing this work on wound treatment and healing is near completion. It is scheduled also for submission to the Journal of Forestry.

Miscellaneous

Representatives of the Wyoming Valley Chamber of Commerce, INCODEL, and the Lehigh River Flood Control Council met with Messrs. Harper, Storey, and Burnham in Wilkes-Barre the first part of February to discuss planting needs for eastern Pennsylvania. With approximately $\frac{1}{6}$ of the forest land in this part of the State barren and denuded these organizations are becoming concerned about the slow progress being made in getting this land back into a productive state. They are also concerned with the ever-increasing damage caused by high water. It was generally agreed by those present that more knowledge is needed on ways and means of getting this job done successfully, quickly, and cheaply.

Burnham and Supervisor Anderson of the Allegheny National Forest discussed employment opportunities in the Forest Service with the upper-classmen in the Forestry School at Pennsylvania State College in February. Both were impressed with the interest shown by the students in their desire to follow forestry as a career and with the high-caliber men to be graduated in the next few years.

QUARTERLY REPORT--CHESAPEAKE BRANCH

JANUARY-MARCH 1949

MANAGEMENT

by Francis M. Rushmore

General

For several weeks during February and March, A. F. Hough was here with us. Most of the time was spent working on problems of management and silviculture.

Hough spent an afternoon at Annapolis with Mr. Pfeiffer and Mr. Bond of the Maryland Department of State Forests and Parks in discussions of research problems for this area. He also spent time on the work which was necessary to get measurements of Virginia pine for checking a cubic foot volume table.

Virginia Pine Thinning Plots

Work on this study, mentioned in previous reports, consisted of simplifying tables and making graphs from the summary tables compiled in 1948. Tree measurements were made on an area adjoining the thinning plots to get information for checking a Virginia pine cubic foot volume table for local use. A pulpwood cutter who was working in the stand was quite cooperative in felling the marked trees. This gave us about half of the required trees. Measurements from the other trees will be obtained in a stand of different age by using a pole caliper.

Reproduction Following Clear-cutting of Virginia Pine

Observations of several areas were made where pure Virginia pine had been clear-cut in strips 100 to 150 feet wide in stands about 35 years of age. It was noted that one section which had been cut about 3 years ago is now overstocked with Virginia pine seedlings. Reproduction is excessive where slash had been removed, but is totally absent beneath several slash piles consisting of four or five tree tops. Last year numerous tall annual weeds grew through the brush piles but were not present where slash had been removed. There were few hardwoods on the clear-cut area nor were there many beneath the nearby uncut stand. Hardwoods had not become established beneath the slash piles.

A similar condition was seen at Cedarville on another area where all trees had been removed except several loblolly pine seed trees. This stand had been cut 5 or 6 years previously. Loblolly pine had failed to reproduce but there was an excellent stand of Virginia pine seedlings. Where the slash had been removed the Virginia pine and a few hardwoods occupied the area. Where slash had been piled there were no pines, but the area was fully occupied by hardwood seedlings which grew out to and followed the irregular outside borders of the slash areas. Some of these areas were 50 X 20 feet.

This condition is present to a lesser extent within several of the thinned Virginia pine plots. On some of the plots there were more hardwoods on the half-plots where slash was left than there were on the side where slash had been removed.

A Study to Test Effects Obtained by Planting in Piles of Burned Slash

Preliminary work has been done to establish plots to test for advantages which might be gained by planting seedlings where slash piles have been burned. All trees on the site had been killed by fire in 1942. The stand is now composed of hardwood sprouts.

Informal observations in 1948 showed that five hybrid poplar cuttings planted on May 5 in an area where a slash pile had been burned had an average height of 2.8 feet on July 21. Five other cuttings of the same clone planted immediately outside the burned area had an average height of only 0.9 feet. The cuttings on the burned plot were the only ones which continued to grow in height after July 21, and by August 25 the average had increased to 3.8 feet. The largest cutting on the plot was 5.9 feet high at the latter date.

All heights shown above for the burned area were nearly the same as those for 36 cuttings of the same clone in a cultivated planting. This cultivated plot was the best of four replicates and continued to grow to an average height of 4.1 feet by October 18. The cuttings on the burned spot did not grow after August 25.

Pole Caliper

With Hough's guidance we made an extendable pole caliper to get diameters to 30-foot heights. The caliper is attached and manipulated as described for a 12-foot pole by Miles Ferree in the Journal of Forestry, August, 1946. Two poles each 13 feet long were attached by a sheet iron sleeve at each end. By pulling a cord the pole may be extended to 26 feet.

A refinement for the pole is a small built-in spring bolt which automatically locks the pole at 17, 20, and 26 feet as it is raised.

When the pole is lowered, it is only necessary to pull on the same cord which is used to raise the pole to prevent the locking at 17, 20, and 26 feet.

A Scale for Bulky Objects

A scale was made, to weigh brush, which was complete in itself without adding a spring scale. Two pieces of 2x4 were bolted at one end. To eliminate a third 2x4 and still have a tripod effect, a piece 1"x4"x3' was attached with a hinge to the back of each 2x4. The hinge was about 2 1/2 feet from the bottom of the 2x4. This permitted the

suspension of another 2x4, from the bolt, which was used as a balance arm. A cradle to hold brush was made from two pieces of steel rod and suspended from the upper end of the balance arm. Known weights were placed on the cradle, then a block of lead was positioned on the balance arm to determine its proper location. For our purpose the points for 25 and 50 pounds were marked. The apparatus has proven useful for weighing brush and small bolts when a uniform weight for each group is desired.

FOREST GENETICS

by Ernst J. Schreiner

First draft of a working plan for hybrid poplar research was completed during this quarter. The plan provides for "sapling" clonal tests of a minimum of 250 new hybrids over a 5-year period. These sapling tests will consist of small, 16-tree plots to provide information on early growth and development (6- to 8-year-old trees) throughout the northeast. In addition to these sapling tests, "crop-tree" clonal tests (in 100-tree plots) are planned for a minimum of 100 of the most promising hybrids over a 5-year period. Both crop-tree and sapling tests will be established in about seven localities throughout the region. In each locality these tests will require approximately two acres per year for the crop-tree tests and 1.2 acres per year for the sapling tests--a total of 16 acres over a 5-year period. Tests will be established this spring at Hopkins Memorial Forest and at the Beltsville Experimental Forest. Until adequate herbicidal control of grass, weeds and sprout growth have been worked out, these tests will be established on land that can be plowed and cultivated for one year.

All poplar stock in the Beltsville Nursery was cut back and made into cuttings during January and February. The cuttings are stored in the SCS storage cellar at Beltsville, and at the Hopkins Memorial Forest.

Considerable work has been done on compiling and summarizing the results of past breeding work with other genera at the Northeastern Station. This has included compilation of growth and development of pedigreed stock both in nursery and field plantings. Work also has been started on a taxonomic study of pedigreed progenies of birch and maple. It is expected that this study will shed considerable light on the nature of so-called varieties, particularly of the white birch, which have been reported to vary in their wood quality. Hybrids between gray birch (female) and white birch (male) are most interesting in this respect because practically all of the hybrids resemble the male parent, and many of them have the taxonomic characteristics of the white birch types in Maine which are considered particularly excellent for turnings.

COOPERATION

Beginning in January, the SCS again had three one-month training sessions at the Agricultural Research Center. Mr. Tinsley, who handles the forestry training sessions, brought each of the three classes (about 20 men in each group) on an inspection tour of the Experimental Forest. They were particularly interested in hybrid poplars and in our planting research on the airport. Schreiner gave two evening lectures on breeding and genetics at the SCS barracks.

MISCELLANEOUS

by Ernst J. Schreiner

On March 21, we had an opportunity to test our forest fire suppression setup. Returning to our headquarters at 11:00 a.m., I found four small fires at 100- to 200-yard intervals along the Bowie Road just east of the East-West Highway and about 1 1/2 miles from our headquarters. Since there were too many fires to handle alone, I drove to our office, notified the ARC and returned with our laborer to put out the fires. There was a man walking toward Bowie who could have started these fires but it seemed unwise to stop for questioning with four fires and a middle Class III day. The ARC brush-fire truck arrived with 5 men within seven minutes of my telephone call and all fires were out within 15 minutes of their discovery.

As soon as the ARC apparatus arrived, I started back to look for the man I had seen walking toward Bowie. I immediately met a Patuxent Refuge foreman who reported that he had just caught the man setting another fire near our entrance gate. He had this man in his truck but lost him when he had to stop to put out another small fire which this man had started since I first passed him on the road.

One of the Patuxent Refuge workers had recognized the man as one Thomas Estep, and Mr. Schlosser, of the Department of Forests and Parks, stated that he had been arrested many times in Laurel but never for arson. The man had been drinking and was apparently under the influence of liquor. He had set six fires in less than a mile.

Since Estep had disappeared near our entrance gate, I immediately came back to headquarters and found that he had inquired from Mrs. Rushmore for directions to the Bowie Race track. Instead of following her directions, however, he went into the woods back of our headquarters building. We searched the wood and Mr. Schlosser called on Fort Meade for an airplane to spot Estep from the air.

About 4:00 p.m., Mr. Beers, ARC Safety Inspector, saw Estep coming out of Telegraph Road onto the Bowie Road. Before he could be caught he climbed the Refuge fence and disappeared in the direction of Cash Lake. The search continued until dark and then guards from the ARC patrolled the Bowie Road all night for possible fires. The State police apprehended Estep in the vicinity of Bowie early Tuesday morning. The ARC has turned this case over to the FBI.

TREE BREEDING AT MORRIS ARBORETUM

by Jonathan W. Wright

Encouraging Results With Spruce

A large part of the first quarter of 1949 was occupied with propagation of the material resulting from the controlled pollinations of 1947 and 1948. The seeds had been stratified soon after collection and were sown in the greenhouse in early January. Germination in most lots of seed is now nearly complete, and it is possible to evaluate the results of the last breeding season.

The most encouraging results were obtained with the spruces. From the cross between the Norway spruce and the Chinese blue spruce 118 definite hybrid seedlings are now growing. Their hybridity was shown by their time of germination and by slight color differences while still in the cotyledon stage. Both parents are the best timber types within their respective ranges. Teng reports the Chinese blue spruce (Picea asperata) to be the most widespread spruce in Yunnan province, the most promising for planting in dry areas, and to have a wood which makes good pulp and is of great value in general construction. It grows about 75 feet tall, and does well in the Northeast. The cross was so successful that it can easily be duplicated on a large scale if the hybrids show the expected promise.

No germination was obtained with the seeds from other crosses involving less closely related species, presumably because the embryos failed to develop.

Hybrid Pine Seedlings

In the pines seedlings were obtained from 5 different hybrid combinations: (1) strobilus x parviflora (1 tree); (2) parviflora x flexilis (1 tree); (3) strobilus x Griffithi (7 trees); (4) strobilus x peuce (1 tree); (5) strobilus x flexilis (14 live trees, 4 dead trees). Two of these combinations are new to science. No germination occurred in several other lots of hybrid seeds. The hybridity of combinations 3 and 5 is fairly certain because of differences in time of germination and in color at the cotyledon stage. Combination 3 is promising, since Pinus Griffithi is an important timber tree in its native India, is very resistant to the white pine blister rust, and grows about as fast as does our eastern white pine in Philadelphia. Combination 5 is not so promising, as both parents are susceptible to the blister rust. It is interesting to note that the hybrids of combination 5 showed intermediacy in disease resistance two weeks after germination; 4 of them had damped off by then in contrast to no damping off in the eastern white pine and about 95 per cent damping off in limber pine.

In addition to the hybrids resulting from controlled pollinations, several supposed hybrids (probably with eastern white pine) germinated from open-pollinated seed collected from an isolated western white pine near Philadelphia. Hybridity was indicated by the great variability of the seedlings in time of germination, appearance, and susceptibility to damping off. This cross has been made several times in California, and gives trees growing much faster than do trees of either parent.

One maple hybrid was obtained from the cross between sugar maple (female) and box elder (male). Hybridity is indicated by the fact that the first leaves are nearly compound. The hybrid is especially interesting and hard to duplicate since the parents are very distantly related.

A few hybrids were obtained from crosses between the red and black oaks. Even though the two species are very closely related, the hybrid and non-hybrid seedlings proved relatively easy to separate when only a few weeks old.

To date little or no germination has occurred in the fir, ash, basswood or tuliptree control-pollinated seedlots.

Chromosome Counts

In many genera it has been found that species with the same chromosome number cross much more easily than do species with different chromosome numbers. Thus it is helpful in forecasting the results of a given cross to know the chromosome numbers of the species involved. Several years ago other workers made counts on many ash and maple species, and found different chromosome numbers in each of the two genera. During the latter part of February and early March chromosome counts were made on dividing root tip, leaf, and pollen mother cells on many species which had not previously been determined. All species counted proved to have the diploid (usual) number. It is interesting to note that counts made on growing leaves must be made very early in the season--when the leaves are only a millimeter or so long. As soon as the buds have broken and the young leaves are clearly visible to the naked eye nearly all cells for the season's growth have been laid down, and further growth is mainly by cell enlargement. (This may be true only in the maples and ashes which have a determinate habit of growth).

It is often desirable to change the chromosome number of plants--especially of rare hybrids such as the sugar maple x box elder hybrid mentioned earlier. Before the war and in 1947 we tried to do this by means of the specific drug "colchicine" (a poisonous alkaloid). Again this spring this work has been followed up, and to date 1 or possibly 3 "polyploid" maples have been produced.

1949 Breeding Season

The 1949 breeding season started in late February when the silver maples bloomed. Several within-species crosses were made involving

parents of different geographic origin in both silver and red maples. (These low-value species are worked because they may prove good guinea pigs for the much more difficult sugar maple, of which we have few trees available.) Arrangements are now being made for pollen shipments from workers in other localities for use in the later breeding work.

Ice Damage

Schreiner (Forest Leaves, 1949) reported on some 8-year old hybrids between Scotch and Japanese red pine which out-grew either parent. The use of Japanese red pine as a female parent has been questioned by many because of the very poor form of older trees. (It's an excellent species in its own country). Observations made after our January 1949 ice storms shed light on the cause of this poor form. Several absolutely straight 6-8 foot wildlings were transplanted from a nearby nursery to the Arboretum last fall. They suffered no winter damage until the ice storms, when all were bent clear to the ground, and two had their leaders snapped right off. Thus this poor form is not inherent crookedness but is probably susceptibility to ice breakage. We need not fear poor form in the hybrids if we can control the ice.

Watch for Wavy Bark

We recently received a reprint of a Swedish paper describing their birch breeding work. In it were pictures of the bark of some of their white birches which produce high-value figure-grained wood. The bark in these figured-grain trees is undulating, following the contours of the wood beneath. We don't yet know whether we can tell figured grain in uncut birch trees as easily as the Swedes can, but it is worth a try. Accordingly I should like to hear from any of you who may notice wavy-barked birch (or other thin-barked trees) in your work. Later I should want seeds or grafting material. (A report of one such tree living is worth more than reports of 100 trees which have gone through the mill.)

QUARTERLY REPORT -- DELAWARE BASIN BRANCH
JANUARY-MARCH 1949

by Herbert C. Storey

Another three months has swished past, allowing us barely time to draw a deep breath. Although the entire staff has been busy during the period, superficially we may not seem to have moved from our position on December 31, 1948. A little deeper digging reveals we have marched on with "Time" and have more observations, a little more knowledge of our watershed and a little better idea of the road ahead.

Delaware-Lehigh Experimental Forest

During the quarter some 33 storms produced an average of 9.65 inches of precipitation upon the Dilldown watershed. These were mostly small, only two storms amounted to more than one inch, 19 of the storms were less than a quarter of an inch. Most of the precipitation was in the form of rain. Total precipitation to March 31 since October 1 is 21.31 inches. If this rate is maintained for the next six months the total for the hydrologic year will be about 42 inches. This appears to be about average for the area. The greatest deviation from normal conditions has been the comparatively small amount of snowfall during the past winter,

Streamflow during the period totalled about 1490 acre feet, which equals approximately 10 inches of depth over the watershed. The peak flow during the period occurred on January 6 and amounted to about 80 cubic feet per second. This is a rate of about 28 C.S.M. These figures must remain tentative until calibration of the streamgaging station is completed.

The fact that total streamflow during the period exceeded the precipitation resulted in a general lowering of the water table throughout the watershed. The average water level in the three groundwater observation wells dropped about eight feet between January 1 and March 31. The large number of small storms coupled with unusually high temperatures and low humidities caused an abnormally high rate of water loss to evaporation. Thus, the amount of precipitation available to groundwater recharge was considerably less than the recorded amount that fell.

Soil pits were dug at all of the eight soil sampling sites during the period. These pits, 3 to 4 feet deep, were large enough to enable an examination of the soil profile. Profiles at all sites except one were approximately alike, being a typical podzol with a highly leached A₂ horizon, and considerable deposition at the top of the B horizon. The soil contains a high proportion of sand. Medium-sized sandstone rocks are plentiful at most sites with a decided concentration in the top 15 inches of soil. The one site not homogeneous with the others has a soil containing less sand and more silt, having been formed from a

shale rather than sandstone. The profile at this latter site does not represent as typical podzol characteristics as the remainder of the area.

Two anemometers have been installed at the Pimple Hill fire tower. One of these is 8 feet above the ground surface and the second 45 feet. The first is approximately at the top of the scrub oak crown. 24-hour average wind velocities for each elevation were plotted on coordinate paper, plotting the 8-foot velocities along the abscissa and the 45-foot figures along the ordinate. These points fell around a fairly well defined straight line. A least squares fit gave the line $Y = 1.577X + 5.526$, Y being the 45-foot velocities and X the 8-foot. A comparison of our results with measurements made in California by Fons of the California Station gave some indication of the effect of scrub-oak in reducing wind velocities at the 8-foot level. He has developed curves for relationships in the open and also in a Ponderosa pine forest. At the 8-foot level a wind velocity of 4 m.p.h. in the open is reduced to nearly zero by the scrub oak, while the pine stand would have a velocity of about 1 m.p.h.; 7 m.p.h. in the open would be about 2 m.p.h. in scrub oak and about the same in the pine; 10 m.p.h. in the open would be about 5 m.p.h. in scrub oak and 2 m.p.h. in pine. These results indicate that as the wind velocity in the open increases the scrub oak has less and less effect as compared to a tall ponderosa pine stand. These figures are of course for a period when the scrub oak is largely bare. During the months of February and March the average velocity at the 8-foot level was 10.6 m.p.h. while the 45-foot level was 22.3 m.p.h. Using Fons' curves the 8-foot level in the open would be expected to have a velocity for this period of about 17 m.p.h. while a ponderosa pine stand would be expected to have a wind velocity of about 2.5 m.p.h. at the 8-foot level. This indicates a reduction of 7 m.p.h. by the scrub oak and about 15 m.p.h. for the pine. The relative reductions in wind velocity near the ground surface suggest interesting effects upon evaporation losses under the different vegetative conditions. This will bear further investigation.

In preparation for further work in the scrub oak conversion study, all surviving Japanese larch and 2-0 pitch pine have been removed from the experimental plots. The best of these survivors (70 larch and 250 pitch pine) have been replanted in fail-spots in the roadside planting area. The Japanese larch and 2-0 pitch pine planted last year was very poor stock, thus necessitating a complete replanting of these plots, in addition to the remaining fail-spots in the roadside area.

Frost Study

A series of tables was prepared for the Flood Control Survey section for use in estimating frost conditions that probably existed in the Allegheny Watershed during certain past floods. This is to assist in their computations of effect of certain changes in land use as part of a proposed flood control program.

Talks and Meetings

A paper by Bethlahmy and Reigner entitled "Factors Influencing the Formation of Impermeable Frost" was presented by Bethlahmy at the Eastern Snow Conference in Greenfield, Mass. Two talks on our watershed research program were given by Storey, one to the Bethlehem Natural Science Association and the other to the Saucon Valley Lions Club.

Manuscripts

"Factors Affecting the Formation of Concrete Frost" by Bethlahmy, Storey and Reigner, for presentation at the annual meeting of the American Geophysical Union in April and for publication in the Transactions of that organization.

QUARTERLY REPORT -- MOUNTAIN STATE BRANCH
JANUARY-MARCH 1949

by Sidney Weitzman

General

Research activities for the quarter were concerned primarily with the establishment of cutting-practice-level plots, writing of a forest management plan for the Fernow Experimental Forest and starting two special studies for the Mountain State area.

Arrangements were made with the Monongahela National Forest to have our automotive equipment serviced and maintained by their personnel.

A working library has been set up on the Fernow Experimental Forest. Ranger Rowland donated a complete set of the Journal of Forestry from 1922 to the present and approximately 1000 bulletins of general interest.

Personnel

Carl J. Holcomb was transferred from the Southern Survey to the Mountain State Branch, January 9, 1949.

William W. Myers, Forestry Aid, was temporarily employed during the month of March on the Fernow Experimental Forest.

Arthur D. Fansler, Forestry Aid, is on a temporary assignment from the Monongahela National Forest for a three months study.

Public Relations, Address, Meetings, Etc.

Weitzman addressed a meeting of the West Virginia Forest Council at Keyser, West Virginia, on the subject of "Watershed Management and Forestry."

Dr. Harper and Weitzman met with Dean Orton and Dr. Percival to discuss the over-all research programs of the Mountain State Branch and the School of Forestry, West Virginia University.

Accompanied by William Huber, Information Specialist of Region 7, Weitzman addressed the student body at the School of Forestry at West Virginia University on February 1 and 2.

Visitors

Dr. Harper spent the weekend of March 5 and 6 at the bunkhouse on the Fernow Experimental Forest. He checked the demonstration area showing the four cutting practice levels and the farm woodlot compartments.

George Cashion spent March 14 and 15 at the Mountain State Branch on an inspection of Administrative Services.

Bernard Frank and a group from Washington spent the weekend of January 21-23 at the bunkhouse and a trip through the Fernow Experimental Forest in an unofficial capacity.

Al Bickford spent a day discussing the work plan for the growth study to be conducted by the Mountain State Branch.

Earl Rogers of the Division of Flood Control Surveys spent a day at Elkins.

George Mullin and Harry Camp spent several days in Elkins with Carl Holcomb and the Southern Survey staff.

Fernow Experimental Forest

1. The cutting-practice-level plots were surveyed, cruised and marked. Each level of cutting is demonstrated on a 5-acre area. A preliminary summary of cut and leave for each cutting-practice level follows:

	Cutting Practice							
	High		Good		Fair		Poor	
	Cut	% Cut	Cut	% Cut	Cut	% Cut	Cut	% Cut
Gross cu.ft./acre ^{1/}	713	39	866	42	1058	69	8554	100
Net cu.ft./acre	535	33	645	38	843	65	1120	100
Basal area sq.ft. ^{2/}	40.6	48	42.7	50	47.3	65	57.8	90
No. Trees/acre	27.0	43	23.6	40	25.2	48	38.9	91

^{1/} Includes all saw trees 11 in. d.b.h. and larger. No poles entered.

^{2/} These figures include basal area of cull trees.

The total volume to be cut on the 20-acre area is 102,000 board feet with an estimated value of \$3,900. on the roadside.

Plans are under way to conduct our own logging and arrangements have been made to rent a D-4 tractor from the Monongahela National Forest on an hourly cost basis. Some progress has been made in obtaining a cooperator.

2. The Appalachian Experiment Station established a fire damage study on the Fernow Experimental Forest in 1935. In these studies every tree 3.5 inches d.b.h. and above was measured and tagged at 5.6 inches using a 2 inch steel finishing nail. This study was abandoned

when the Fernow was inactivated. Many of the nails were completely grown over by 1948. It was necessary to chop them out. Nails have been removed and remeasurements taken on 18.4 acres out of a total of 20.9 acres. These remeasurements will supply information on growth and mortality of an unmanaged stand on the forest. The data will prove helpful in planning work on the Fernow.

3. The Appalachian Experiment Station also initiated a grapevine study on the same area. All trees with grapevines were tallied and the number and size of vines entering each tree were recorded. Grapevines were removed on two acres of the 20.9 acres. The data has been collected and will be analyzed to determine the influence of grapevine removal on diameter growth of trees.

Growth Study

Field work has started on a growth study in the cove hardwood type of West Virginia. This study is designed to determine the major factors effecting growth of the principal tree species as an aid in the management of this important forest type. In addition, diameter and volume growth for the last decade by sites, vigor classes and species groups will be considered.

Strip Mine Study

A survey of the strip mine problem in West Virginia has been started. Its purpose is to determine the extent of strip mining in the State, the success of artificial revegetation, and the results of natural revegetation. The influence of individual factors such as soil pH, seed source, character of overburden, etc., on revegetation of strip mining areas will be investigated.

QUARTERLY REPORT--PENOBSCOT BRANCH

January-March 1949

By T. F. McLintock 1/

The threat of a large-scale spruce budworm epidemic in Maine continues to dominate the research program at this Research Center. Poised like a precursor of impending destruction, the present light infestation in the northern tip of our territory is giving timberland owners cause for worry. In answer to apprehensive requests for more information as to how the insect works and how to combat it, we are beginning to show some tangible results of our experimentation over the last four years.

Hazard Mapping

A one-day discussion meeting was held at our headquarters in March, with woods managers and foresters for seven companies, representing nearly five million acres of timberlands in Maine, attending. The techniques developed at this Branch for mapping spruce-fir stands in terms of budworm hazard were presented in detail. Economic factors controlling the feasibility of operations in so-called high-hazard stands were discussed, and the element of "risk" was given considerable attention. The possibility of mapping vulnerable stands from aerial photos was also explored. The company representatives present expressed their willingness to launch a program of stand evaluation in terms of budworm hazard, leading to the establishment of cutting priorities wherever possible.

Budworm Damage Appraisal

From two different sources, data were summarized to shed more light on the nature and extent of damage arising from defoliation. Preliminary analyses of increment cores taken from more than 150 balsam fir showed that during the last budworm epidemic in Maine (1910-1920) diameter growth was reduced by more than 55 percent on two-thirds of the trees. The effect of defoliation was most pronounced among trees with diameter growth rates prior to attack of less than 0.12 inch per year. The effect became less as previous growth rate increased, and fir growing more than 0.25 inch per year in most cases showed no budworm "pattern" whatsoever. The growth rate prior to attack, however, had no effect upon the duration of the depressed growth period, which averaged seven years.

Trees in the heavy epidemic area of Quebec were examined last fall and data were analyzed this quarter. On all fir 100 percent of the 1948 foliage was destroyed, and the damage to old foliage was greatest in dominant and co-dominant trees of high vigor (i.e., having external features indicative of rapid growth). Defoliation of white spruce was about 50 percent as severe as fir, and damage to black spruce was negligible. Actual mortality of fir at the end of the fifth year of the epidemic was 15.4 trees per acre 4 inches d.b.h. and larger, or 7.8 percent of the total number of fir.

1/ Some sections of this progress report, as noted thereon, were compiled or written by other members of the Penobscot staff.

Working Tools

A job currently being undertaken by this Branch is the preparation of a series of tables and charts embodying basic tree data for spruce and fir in Maine. These "working tools" will include taper curves, bark thickness tables, volume tables, and other similar material. While this is a somewhat elementary project, the need for such information is quite pressing. In many cases there are no data available, and even where published material exists it is usually incomplete or scattered.

The following summaries are among those recently completed and are based on tree measurements gradually picked up, during the last three years, in conjunction with other data being taken for regular projects.

D.b.h. class	Red spruce			Balsam fir		
	Dbl. bark thick- ness	Merch. ht. as % of total height	D.b.h. as % of stump diam.	Dbl. bark thick- ness	Merch. ht. as % of total height	D.b.h. as % of stump diam.
	<u>Inches</u>	<u>Percent</u>	<u>Percent</u>	<u>Inches</u>	<u>Percent</u>	<u>Percent</u>
4	0.22	--	76.9	0.17	--	74.1
5	.29	--	78.1	.23	--	78.1
6	.35	57.5	78.9	.29	53.5	81.1
7	.41	64.4	78.7	.35	58.3	82.4
8	.47	68.8	80.0	.42	62.7	83.3
9	.53	71.2	80.4	.48	66.7	82.6
10	.59	72.7	80.0	.54	68.4	82.6
11	.66	75.4	80.3	.59	69.5	82.7
12	.72	78.0	80.5	.64	72.1	82.8
13	.78	79.0	80.7	.68	73.0	82.3
14	.83	79.7	81.4	.71	73.8	82.4
15	.87	80.6	81.5	.74	74.6	82.4
16	.91	81.2	81.6	.76	75.4	82.5
17	.94	81.7	82.1	.78	76.1	82.1
18	.96	82.2	82.6	.80	77.8	81.8
19	.99	84.0	82.6	--	--	--
20	1.01	84.4	83.0	--	--	--
<hr/>						
Basis:						
no. trees	280	240	267	337	297	805

The above data were compiled and summarized by W. J. Kidd, Jr. and E. C. Goodine.

Pulpwood Cutting Time Studies (by Arthur C. Hart)

Analysis of the pulpwood production time study data from the Win-nipesaukee and Penobscot Branches of the Station is nearing completion. The data cover typical pulpwood operations of the spruce-fir region of the Northeast, including both rough and peeled wood, "stump cut" and skidded wood. On each study area, production time per unit of volume has been determined for each phase of the work by diameter class for spruce and fir separately.

Based on time elements from felling through piling, following are some of the general results that have so far appeared:

1. About three times the effort is needed to produce a cord of wood from 5-inch trees as from 15-inch trees. This bears out the commonly accepted premise that more time per unit of volume is required to harvest small as compared to large trees.
2. Optimum tree size seems to be about 15 inches d.b.h. Larger trees require proportionately more effort in bucking and piling. Usually two men are needed to handle them.
3. Indications are that partial cutting does not increase the time needed to produce a cord of wood over clear cutting. In fact, on the one job for which a direct comparison is available, time savings of 7 percent for fir and 18 percent for spruce occurred for partial cutting.
4. The bucking phase of producing pulpwood takes the greatest proportion of time, the proportion varying with the type of the operation.
5. Spruce requires more time per cord than does fir. Fir takes more piling time, and slightly more peeling time, but higher felling and bucking time for spruce more than offset this. Spruce is harder to cut than fir, yet weighs less than fir when green.

The average percentage of total time required for each phase of the work for different types of operations is shown by the following tabulation:

Peeled Wood

	<u>Skidded wood</u>		<u>Stumpwood</u>	
	<u>Fir</u>	<u>Spruce</u>	<u>Fir</u>	<u>Spruce</u>
	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>
Fell	10	12	12	14
Limb	15	16	19	19
Peel	19	18	33	31
Skid	15	11	—	—
Buck	27	31	21	26
Pile	<u>14</u>	<u>12</u>	<u>14</u>	<u>10</u>
Total	100	100	100	100

Rough Stumpwood

	<u>Clear-cut</u>		<u>Partial cut</u>	
	<u>Fir</u>	<u>Spruce</u>	<u>Fir</u>	<u>Spruce</u>
	<u>%</u>	<u>%</u>	<u>%</u>	<u>%</u>
Fell	16	19	16	19
Limb	28	22	30	23
Buck	36	40	29	38
Pile	<u>20</u>	<u>19</u>	<u>25</u>	<u>20</u>
Total	100	100	100	100

Miscellaneous

The experimental forest approached a few notches closer to actuality with the preparation of dummy leases for consideration of the nine cooperating companies. It is still hoped that a final decision will be reached by May 1.

Forestry students at the University of Maine were interviewed by Mason Bruce of the White Mountain National Forest, accompanied by McLintock.

Plans are nearing completion for the establishment of a 200-acre experimental cutting area on State land. The Research center staff marked a sample acre on the proposed tract for consideration of the Forest Commissioner and interested contractors.

The working plan for a tree classification study of spruce and fir was completed and sent to Upper Darby for approval, and revision of the problem analysis for this Branch was begun.

McLintock accompanied McGuire of the Massabesic Experimental Forest to Acadia National Park to confer with Park Service officials. They had asked for advice and assistance in the rehabilitation work on the burned-over portion of the Park.

Considerable time was spent in preparing for a timberland owners' growth conference to be held at our headquarters in April or May. A good deal of confusion now exists as to appropriate and more effective growth prediction methods to give desired results, and widely divergent ideas and objectives have so far prevented any unified approach to what is a common problem. This branch is taking the lead in organizing the conference which will attempt to define specific objectives, agree upon standardization of terms, tools and techniques, and set up uniform growth methods.

QUARTERLY REPORT -- WHITE PINE BRANCH

JANUARY-MARCH 1949

by John R. McGuire

General

Study plans and reports, office compilations and mapping occupied most of the time of the branch staff during the quarter.

The winter was one of the mildest within memory of the oldest inhabitant. Even in January, violets bloomed in Sumner Ricker's dooryard. Little additional mortality of fire-damaged trees was noted.

Final accounting showed that \$37,671 was received last year from the J. A. Gillies Lumber Co. as stumpage value of 4,184,000 board feet of fire-damaged timber cut on the Massabesic Experimental Forest. In addition the same company deposited \$23,300 for sale area betterment and slash disposal. About \$5,500 has already been returned to the State; \$4,000 will be returned next fiscal year. This sum at least equals the amount that the towns would have received as taxes, had the Massabesic Forest area been in private ownership since 1936. The Gillies sale alone, though it covered only one-sixth of the Forest, returned to the Treasury almost twice the original cost of the entire Massabesic area.

The staff has taken an active part in the organization of a forest forum in Western Maine. This organization, composed of foresters, loggers, sawmill operators and others from wood-using industries, meets every month to discuss and debate topics of common interest.

Preliminary plans were made for cooperating with the Bureau of Entomology and Plant Quarantine in further studies of white pine weevil and control.

The current work of the branch was described for the Kennebunk Lions Club, Alfred High School, a Farm and Home Week audience at the University of Maine, and forestry students at the universities of New Hampshire, Massachusetts, Connecticut, and Maine. At three of these schools, students interested in forest research were interviewed.

Acadia National Park at Bar Harbor was visited to assist in preparing plans for rehabilitation of that scenic area.

Forest Management Studies

The compartment study described last quarter was revised. Particular attention was given to definitions of cutting-practice levels which would represent the entire range of management possibilities suitable for the White Pine Region. Thirty-two compartments were set aside for this

long-range study; nine in green stands, the remainder lightly or moderately burned over by ground fire in 1947. A local lumber company is willing to cooperate in the financing of this study. The logging job will be performed by branch employees. The primary variables will be level of cutting practice, system of harvesting mature timber so as to reproduce the stand and product objective. The latter will compare the production of quality sawlogs on a relatively long rotation with production of maximum volume of wood on a short rotation. The following design for the use of these compartments was approved by the Director:

<u>Cutting Practice Level</u>	<u>System of Harvesting</u>	<u>Product Objective</u>	<u>Number of Compartments</u>
High-order	Shelterwood	Quality	4
		Volume	4
	Patch cutting	Quality	4
Good	Shelterwood	Quality	4
		Volume	4
	Patch cutting	Quality	4
	Strip cutting	Quality	2
Fair	Diameter limit cutting		2
	Seed tree cutting		2
Poor			2
Total			32

Time-keeping record forms for the compartment study were prepared along with a numerical key for tabulating the various jobs that might be undertaken on each compartment. (McConkey)

Two small salvage sales were studied for preliminary estimates useful in planning the compartment study. Data were obtained on log grades and costs of logging with a three-man crew. (McConkey)

With the pilot plant compartment layout completed it was possible to prepare a map showing how the Massabesic Forest can best be utilized for various kinds of research and where post-fire rehabilitation measures

are most needed. (McConkey)

A study was prepared to obtain side-by-side comparisons of cutting-practice levels on 8-acre plots. These will be established on a readily accessible area where interested persons can see, in close proximity, the four cutting-practice levels used in the compartment study. These plots will also be used to get preliminary comparisons of costs and yields under various levels of cutting and as a training area for branch personnel.

Regeneration Studies

Several pounds of white pine seed were stratified in preparation for sowing on prepared sites this spring. This sowing was scheduled for last fall but so much of the seed was removed by rodents and birds that the study had to be postponed. No good rodent repellent is known. Poisoning would seem to be too hazardous for this region. It is hoped that rodent and bird damage can be minimized by sowing stratified seed just before it germinates so that it will be exposed to such depredations as little as possible. If this does not prove successful, further white pine seeding studies will be postponed until a suitable repellent is available. (Williamson)

The branch participated in a public meeting at Alfred, Maine, where a report by Rettie and Banks provided the basis for discussion of rehabilitation of fire-damaged lands in Southwestern Maine.

Fire Effects Studies

Prior to this quarter, preliminary summaries had indicated that white pine trees burned in the fall of 1947, but not killed, were growing more slowly and producing more cones than unburned trees. During the quarter a progress report was prepared to consolidate this information. When 1947 terminal growth is used as an expression of tree vigor, apparently the more vigorous trees have greater circumference of living cambium at the root collar and a greater number of sections of living cambium at the root collar than the less vigorous trees. Terminal growth in 1947 is more highly correlated with terminal growth in 1948 than either tree diameter or width of living cambium at the root collar. (McConkey)

QUARTERLY REPORT -- WINNIPESAUKEE BRANCH
JANUARY - MARCH 1949

By V. S. Jensen

An analysis of pulpwood production cost-time data and compilation of recruise tallies have been the major activities at the Winnepesaukee Branch during the first quarter. By agreement with the cooperators' findings on each area will be held in strict confidence, to be released only in combination with several jobs. However, some rather general information largely incidental to the main purposes of the study can properly be reviewed.

Compliance of Cutting with Marking

An analysis of cutting compliance with marking has been made on one job. On a stand-tally basis results were highly satisfactory. This does not hold if volume data are analyzed.

For the tract as a whole, after making proper allowances for road clearing, 3.1% of the trees to be reserved were cut. These accounted for 9.2% of the reserve volume. As 8.2% of the marked trees were not cut they more than offset the unmarked trees, a net increase of 5.2% in the residual stand. The marked trees that were not cut were, however, well below average size, accounting for only 3.8% of the marked volume. In spite of more than 5% more trees on the tract, the volume was 1% less than anticipated in marking.

An inspection on the ground indicated that in some cases a substitution of a marked for an unmarked tree was not too important. In most cases, however, the uncut marked trees were below average size and not particularly promising individuals. It is assumed that those designated to reserve but cut were reasonably good risk trees in all respects. The average marked tree (7") left had only a third of the volume of the 11" average unmarked tree that was cut.

On a per-acre basis an average of about 2 unmarked trees per acre were cut and 6 marked trees were not cut.

Loss of Productive Areas in Roads

The pulpwood operations on several budworm study-areas indicate substantial acreages are cleared for roads. However, the acreage is rather moderate as compared with losses resulting from usual clear-cutting methods. On 594 acres selectively cut and twitched, about 36 acres, or 6.1%, were cleared for temporary winter reyarding and truck roads. Including permanent (or semipermanent) gravel roads a total of more than 50 acres, 8.5%, were cut clean. The above figures include strips adjacent to woods roads necessarily cleared for pulpwood ricks. Banking grounds and camp sites are not included.

The loss (at least temporarily) of wood production on 8.5% of the total area is probably a conservative figure. On a 400-acre selectively cut tract the land manager reported 12.3% of the area cleared for roads and pulpwood storage.

Stump cutting (windrowing) operations involved the clearing of more than twice the area involved in selective cutting, 15% for stump roads, plus an additional 2.8% for gravel roads or a total of 17.8%. Provided adequate stocking of small merchantable or near-merchantable trees bordered these numerous clear-cut strips, the residual stand condition would be much improved. In practice most merchantable trees adjacent to stump roads are cut. Reasonable compliance with minimum cutting standards, if any, are obtained only on a narrow strip midway between stump roads.

Logging Damage

Damage to residual trees resulting from logging is a consideration in changing over from usual present clear-cutting methods to more conservative selective cutting practices. Logging damage data were collected in recrusing all budworm areas after cutting. Present indications may well be revised following analysis of additional data. Very little information is available on the number of trees to be reserved that were damaged and utilized. More than 90% of the recorded damage noted in recrusing was bruising or more commonly scraping off of bark on the roots or base of trees as a result of twitching long logs or tree lengths. Although 8% of the residual spruce and fir of merchantable size (6" d.b.h. plus) were damaged, probably the development of only a very small fraction of these trees will be adversely affected. Trees damaged were slightly above average size (8.3% of the residual volume). Damage was apparently slightly greater where a high proportion of the trees were cut. Contrary to expectations, residual tree damage was slightly higher in softwood-hardwood than softwood stands in spite of a lighter cut of a generally more open and lighter stand.

Power Versus Buck Saw

Production cost-time studies provided a basis for comparing the output of men using power saws and buck saws. Choppers worked on the same job, under comparable conditions, but unfortunately there was no opportunity to compare the same crews or individuals using both types of equipment. Production time per cord followed the same trend for practically all diameter classes, lowest for power on fir, next lowest for power on spruce, followed by buck saw crews cutting fir and spruce. These trends held not only for bucking and felling where saws were used but also for limbing, peeling, and piling. There are two probably explanations for this consistent spread, better and more ambitious choppers purchased power saws and also these men probably conserved energy in using power equipment and therefore worked more effectively on other phases of the job.

In using power saws (both 1 and 2-man units) as compared with hand work savings in total production time (except skidding) were most apparent in working up large trees; about 31 and 21% for 18" spruce and fir, respectively, as against gains of 14 and 12% for 6" spruce and fir. This difference is mainly due to the high ratio of nonproductive (moving and work preparatory to sawing) to productive time in working up small trees.

Peeling Small Trees

The piece workers' objection to peeling small wood apparently is well founded. Aside from a dirty job during fly season, data collected on production time-cost studies indicated that on the average second growth spruce-fir chance where trees cut average 9-10" d.b.h., about 30% of the total production time (not including skidding) was spent peeling. However, this phase of the job accounted for as much as 40% of the total for 6" trees as compared with 20% for trees over 16" d.b.h.

